

The concept of personal communication systems (PCS) aims at providing two-way communication services, speech and data to individual business users and consumers on the move, indoors and out. Its goal is to establish a mass network for mobile communications and provide a competitive alternative to the conventional wired public switched telecommunication network. The widespread impact of these new technologies has raised concerns about the safety of human exposure to RF energy emitted by these telecommunication devices.

It is noteworthy that a large segment of the world's population is now exposed to RF and microwave radiation. We need a better understanding of the biological effects of RF electromagnetic field so that we can safeguard against possible harm to the general population and increase its beneficial medical uses. Fortunately within the last few years there has been a resurgence of research interest in achieving a quantitative understanding of the relationships between the biological effects of RF radiation and the physical variables that may cause them. Some results are beginning to appear in the literature.

This chapter reviews the biological effects of exposure to electromagnetic fields from wireless communication technology. Studies on the specific radio frequency spectra used for mobile telephones have only begun within the past few years. It will take a few more years before the results are widely disseminated. Accordingly, results from earlier studies using frequencies in the same spectral band will be summarized together with an overview of current research activity where appropriate.

CHARACTERISTICS OF WIRELESS COMMUNICATION SYSTEMS

Mobile telephones use frequencies in the 800-2200 MHz region of the radio frequency spectrum. **Table 1** shows that these frequencies vary for different countries. Moreover, the first generation mobile telephones are based on analog technology and the output power is typically 600 mW. Digital communication service has been rapidly expanding in recent years. Its advantages over analog systems include compression by source coding and transmission through channel coding to reduce noise, error, and cross talk. They have made digital mobile technology competitive at power consumption as low as 10 mW. These digital systems use several modulation schemes and the transmission rate varies from 10's to 100's kb/s.

The Federal Communications Commission (FCC) permits an effective radiated power (ERP) of up to 500 W per channel, depending on the tower height and geographical region. The majority of currently installed cellular base stations in urban and suburban areas operate at an ERP of 100 W or less per channel. In large cities, with typical ERPs on the order of 10 W or less per channel, antennas used are usually smaller. The power output of the base station could be reduced from 100 W for the present system to 1 W for a microcell configuration using digital techniques. The corresponding field strengths range from 3-10 V/m at a typical distance from the source. Of course, the precise field strength measured in each situation will differ according to distance and source type (handheld, land mobile, or base station). In addition, amplitude modulated fields are intrinsic in all present and future mobile telephone systems using time division multiple access (TDMA) and code division multiple access (CDMA) schemes.

Table 1. Freq

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